UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/015,224	12/13/2001	Jun Sawada	AUS920010610US1	6318

7590 07/22/2005	EXAMINER
Duke W. Yee, Carstens, Yee & Cahoon, LLP P.O. Box 802334 Dallas, TX 75380	SILVER, DAVID

ART UNIT	PAPER NUMBER
2128	

DATE MAILED: 07/22/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/015,224	SAWADA, JUN
	Examiner	Art Unit	
	David Silver	2128	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed
  after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any
  earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is
closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-31* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-31* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *2/27/2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All   b)☐ Some *   c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage
application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date *2/27/02*.

4)☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ .

5)☐ Notice of Informal Patent Application (PTO-152)

6)☐ Other: _____.

U.S. Patent and Trademark Office

PTOL-326 (Rev. 1-04)   Office Action Summary   Part of Paper No./Mail Date 07142005

DETAILED ACTION

Claims 1-31 are pending.

Claim Objections

1.   Claim 27 is objected to because of the following informalities:

   a.   As to claim 27, the word "one" is misspelled.

   Appropriate correction is required.

Information Disclosure Statement

2.   The information disclosure statement (IDS) submitted on 2/27/2002 is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Specification

3.   The incorporation of **essential material** in the specification by reference to an unpublished U.S. application, foreign application or patent, or to a **publication** is improper. Applicant is required to amend the disclosure to include the material incorporated by reference, if the material is relied upon to overcome any objection, rejection, or other requirement imposed by the Office. The amendment must be accompanied by a statement executed by the applicant, or a practitioner representing the applicant, stating that the material being inserted is the material previously incorporated by reference and that the amendment contains no new matter. 37 CFR 1.57(f).

Claim Rejections - 35 USC § 101

4.   35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

1.   Claims 1-26 are rejected under 35 U.S.C. 101 because the claimed invention is drawn to non-statutory subject-matter.

a.   Specifically, claims 1-13 and 14-26 are not technologically embodied since claims have not recited any limitations relating to a practical application in the technological arts and have merely claimed non-statutory subject matter and non-tangibly embodied (computer program product in a computer-readable medium) content. The examiner therefore submits that the application has not recited any limitations that provide a tangible result and have merely claimed software and non-tangibly embodied content.

b.   Specifically, claims 1-13 are not limited to tangible embodiments. In view of Applicant's disclosure, in cases when the hardware being simulated is simple (as shown by Applicant's figures) the validation can be performed and does not require the use of hardware.

c.   Specifically, claims 14-26 recite "computer-readable medium" which is an intangible medium (e.g., carrier signal, digital and analog communications links, wired or wireless communications, as stated in paragraph 75 of specifications). As such, the claim is not limited to statutory subject matter and is therefore non-statutory. The examiner respectfully suggests that claim 14 be further limited by having a physical

embodiment. The examiner respectfully suggests that claim 14 be further

limited to tangible computer readable medium.

> Section 2106 [R-2] (Patentable Subject Matter – Computer-Related
>
> Inventions) of the MPEP recites the following: "Data structures not
>
> claimed as embodied in computer-readable media are descriptive
>
> material per se and are not statutory because they are not capable
>
> of causing functional change in the computer. See, e.g.,
>
> Warmerdam, 33 F.3d at 1361, 31 USPQ2d at 1760."

d.   As such, the claim is not limited to statutory subject matter and is

therefore non-statutory.

The examiner therefore submits that Applicant's have not recited any

limitations that provide a tangible embodiment and have merely claimed

intangible methods and carrier signal, which are not tangibly embodied.

An invention which is eligible for patenting under 35 U.S.C 101 is in the

"useful arts" when it is a machine, manufacture, process or composition of

matter, which produces a concrete, **tangible**, and useful result.

"Tangible" – Applying In re Warmerdam, 33 F.3d 1354, 31 USPQ2d 1754

(Fed. Cir. 1994), the examiner will determine whether

> i.   there is simply software which is not tangibly embodied in a
>
> matter so as to be executed;
>
> ii.   there is simply intangible media such as signals, carrier
>
> waves, transmission waves or other media incapable of being

touched or perceived absent of tangible medium through which

they are conveyed.

The examiner respectfully submits, under current PTO practice,

that the claimed invention does not recite a tangible embodiment and is

merely drawn to non-statutory subject matter and intangible media.

Claim Rejections - 35 USC § 103

5.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for

all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described
> as set forth in section 102 of this title, if the differences between the subject matter sought to
> be patented and the prior art are such that the subject matter as a whole would have been
> obvious at the time the invention was made to a person having ordinary skill in the art to which
> said subject matter pertains. Patentability shall not be negatived by the manner in which the
> invention was made.

6.   Claims 1-31 are rejected under 35 U.S.C. 103(a) as being unpatentable

over "Equational Binary Decision Diagrams" by J. F. Groote and Jaco van de Pol

("Groote" hereinafter), and further in view of Kondo H. and Kurihara M. ("Kondo"

herein after). See PTO-892 for publication information.

b.   As per claim 1, Groote substantially discloses the claimed

invention, a method for validating a hardware design through the use of a

binary decision diagram ("BDD" hereinafter) (pg.: 1 section 1 lines: 1-4).

Validation is performed by applying one of a plurality of transformation

rules to simplify a BDD containing variables which represent a hardware

design to be validated (pg.: 9, line: 3rd from bottom "top-down

transformation algorithm") wherein the algorithm is based on a set of rules

as stated by page 9, definition 22. Then, repeating the transformation

rules to the BDD until no more of the transformation rules may be applied and determining, when no more of transformation rules can be applied (pg.5 section 2.2, lines 2-3), whether the BDD has been reduced to a single true value (pg.1 section 1 lines 5-7, "tautology"). Meaning, there is an "equivalence of specification and design" as stated on page 1, section 1, lines 5-6.

Although Groote discloses the inclusion of variables in the BDD, the reference does not specifically detail the inclusion of function symbols. However, Kondo discloses an analogous system wherein the function symbols are included in the BDD (See Kondo's abstract). It would have been obvious to one of ordinary skill in the art of hardware validation with the use of BDDs, at the time of the present invention, to combine the teachings of the cited reference. In fact, Groote mentions such motivation on page 3, paragraph 2, lines 5-6 by stating that they envisage that such inclusion can be accomplish straightforwardly.

c.   As per claim 2, Groote substantially discloses the claimed invention, comprising defining a first ordering relation on a set of terms, including variables (pg.4, definition 5, line 1). Although Groote discloses the inclusion of variables in the BDD, the reference does not specifically detail that the ordering relation will be applied to function symbols. However, Kondo discloses an analogous system wherein the function symbols are also included in the ordering relation on the terms (See Kondo's abstract). It would have been obvious to one of ordinary skill in

the art of hardware validation with the use of BDDs, at the time of the

present invention, to combine the teachings of the cited reference. In fact,

Groote mentions such motivation on page 3, paragraph 2, lines 5-6 by

stating that they envisage that such inclusion can be accomplish

straightforwardly.

d.   As per claim 3, Groote discloses a method of claim 2, wherein the

first ordering relation follows a subterm property (page 4, definition 5, line

1).

e.   As per claim 4, Groote discloses a method of claim 2, wherein the

first ordering relation follows a monotonicity property (page 5, definition 8,

lemma 9: Proof).

f.   As per claim 5, Groote discloses a method of claim 2, further

comprising:

        i.   in response to defining the first ordering relation, defining a

        second ordering relation on a set of equalities, wherein the set of

        equalities includes equalities between terms ordered by the first

        ordering relation (page 4, definition 5, line 4).

g.   As per claim 6, Groote discloses a method of claim 1, wherein the

plurality of transformation rules includes

        ii.   mapping a node of the form ite(s=s,H,K) into a node of the

        form H (page 5, definition 6, item 6).

h.   As per claim 7, Groote discloses a method of claim 1, wherein the

plurality of transformation rules includes

    iii.   mapping a node of the form ite(s=t,H,K) into a node of the

form ite(t=s,H,K) in response to a determination that t is greater

than s in an ordering relation having a subterm property and a

monotonicity property (page 5, definition 6, item 7).

i.   As per claim 8, Groote discloses a method of claim 1, wherein the

plurality of transformation rules includes

    iv.   mapping a node of the form ite(s=t,H,H) into a node of the

form H (page 4, definition 6, item 1).

j.   As per claim 9, Groote discloses a method of claim 1, wherein the

plurality of transformation rules includes

    v.   mapping a node of the form ite(s=t,ite(s=t,H,K),L) into a node

of the form ite(s=t,H,L) (page 4, definition 6, item 2).

k.   As per claim 10, Groote discloses a method of claim 1, wherein the

plurality of transformation rules includes

    vi.   mapping a node of the form ite(s=t,H,ite(s=t,K,L)) into a

node of the form ite(s=t,H,L) (page 4, definition 6, item 3).

    vii.

l.   As per claim 11, Groote discloses a method of claim 1, wherein the

plurality of transformation rules includes

    viii.   mapping a node of the form ite(s_1=t_1,ite(s_2=

t_2,H,K),L) into a node of the form ite(s_2=t_2,

ite(s_1=t_1,H,L),ite(s_1=t_1,K,L)) in response to a

determination that s_1=t_1 is greater than s_2 t_2

according to a pre-determined ordering relation (page 4, definition

6, item 4).

m.   As per claim 12, Groote discloses a method of claim 1, wherein the

plurality of transformation rules includes

ix.   mapping a node of the form ite(s.sub.1=t.sub.1,H,

ite(s.sub.2=t.s- ub.2,K,L)) into a node of the form ite(

s.sub.2=t.sub.2,ite(s.sub.1=t.sub.1- ,H,K),ite(s.sub.1=t.sub.1,H,L))

in response to a determination that s.sub.1=t.sub.1 is greater than

s.sub.2=t.sub.2 according to a pre-determined ordering relation

(page 4, definition 6, item 5).

n.   As per claim 13, Groote discloses a method of claim 1, wherein the

plurality of transformation rules includes

x.   mapping a first set of nodes that are true children of a node

of the form ite(s=t,H,K) into a second set of nodes that is identical

to the first set of nodes except that occurrences of s in the first set

of nodes are replaced by t in the second set of nodes (page 4,

definition 6, item 8).

o.   As per claim 14-26, the claims differ only in statutory basis to

claims 1-13 (14-26 are the product for the method of claims 1-13).

p.   As per claim 27-31, the claims differ only in statutory basis to

claims 1-6 (27-31 are the product for the method of claims 1-6).

Claims 1-31 are rejected.

Conclusion

7.   The prior art made of record and not relied upon is considered pertinent to

applicant's disclosure.

q.   Reference A discuses the use of BDD and transformation that can

be applied to the BDD and thus is relevant to claims 1-6 and claims that

differ only by statutory basis.

r.   Reference B discuses the use of BDDs to verify computer hardware

and as such relates to claims 1-2 and claims that differ only by statutory

basis.

Any inquiry concerning this communication or earlier communications from

the examiner should be directed to David Silver whose telephone number is

(571) 272-8634. The examiner can normally be reached on Monday thru Friday,

8am to 4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the

examiner's supervisor, Jean Homere can be reached on (571)272-3780. The fax

phone number for the organization where this application or proceeding is

assigned is 703-872-9306.

Information regarding the status of an application may be obtained from

the Patent Application Information Retrieval (PAIR) system. Status information

for published applications may be obtained from either Private PAIR or Public

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direct.uspto.gov. Should you have questions on access to the Private PAIR

system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-

free).

David Silver
Examiner
Art Unit 2128

JEAN R. HOMERE
PRIMARY EXAMINER